

### 3.1 Ga Banded Iron Formation drilling: DXCL drilling project in the coastal Pilbara terrane in Australia

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The Dixon Island –Cleaverville Drilling Project (DXCL) was successfully completed at Cleaverville Beach, northwestern Pilbara Craton, at August 2007, 2012. The drilling provided ‘fresh’ samples (free of recent, near-surface weathering effects) of Archean banded iron-formation (BIF) and black carbonaceous shale. The formations drilled were the Cleaverville Formation, Dixon Island Formation, and Port Robinson Basalt (new name), all interpreted as belonging to a Mesoarchean immature island-arc succession at three drilling site, DX, CL1, CL2 and CL3. Drilling revealed that although modern weathering at Cleaverville Beach extends to depths of 50 m and the drill core is suitable for petrologic, geochemical, and isotopic investigations. Here we focus CL3 core (200m long) which focus the Cleaverville Formation with BIF. The BIF in this area is well exposed along the coast area.

The Cleaverville Formation was subdivided by the Black Shale and BIF members. The Black Shale Member formed organic rich black shale which formed 10-20 cm thick beds and with thin silt- very fine sandstone lamination. The fine grain is mostly related volcanic origin plagioclase. These volcanoclastic laminations have well preserved cross laminations and identified as younging direction. The thin very fine sandstone laminations are increase to the top. The BIF Member formed three units, 1) Siderite BIF unit which formed fine laminated greenish shale/white chert and massive chlorite rich greenish shale, 2) Magnetite BIF unit which formed fine lamina of magnetite/white chert and massive chlorite rich greenish shale, and 3) Black shale-siderite unit which formed fine laminated black shale and greenish siderite.

In detail observation, the BIF Member not contains detrital grains such as volcanoclastics origin fine sandstone. Bedded thickness in Siderite BIF and Magnetite BIF is resembles about 10-20 cm in each bed, also massive greenish shale beds are resembled each unit. The greenish massive greenish shale is very homogenous. These beds are corelated red and white beds in outcrop, which have lateral variation of thickness from 50 –100m wide. Some these beds are more than 80 cm in thickness to change 10 cm in thickness.

In addition, magnetite laminations are only formed in fine lamina of greenish shale portion in the Siderite BIF. The most BIF Member contains overgrowth siderite crystals especially in white chert lamination. Most place of Siderite BIF and Magnetite BIF are not containing early stage sedimentation evidence. Only black shale-siderite unit contains organic rich wavy laminations. It might be preserved primary sedimentation evidence during deposition of iron material. These very thin wavy laminations suggest that the microbial (Iron oxidized bacteria) activity might be occurred on the ocean floor surface. However, it is still unknown of the origin of homogenous greenish shales as sedimentary muds or diagenetic beds.

Keywords: BIF, greenstone belt, Archean, siderite, magnetite

